Tool 1

Mathematics Content

Grades 9-12

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| **CCSSM Curriculum Analysis Tool 1—Interpreting Functions in Grades 9-12** | | | | | |
| Name of Reviewer \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ School/District \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Name of Curriculum Materials \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Publication Date \_\_\_\_\_\_\_\_\_\_\_ Course(s) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | | | | |
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| **CCSSM Standards Grades 9-12** | **Chapter pages** | **Cont N-L-M-**  **A-H** | **Bal N-L-M-**  **A-H** | | **Notes/Explanation** |
| **Interpreting Functions (F-IF)** |  |  |  | |  |
| **Understand the concept of a function and use function notation** |  |  |  | |
| 1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range.  If *f* is a function and *x* is an element of its domain, then *f*(*x*) denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation *y* = *f*(*x*). |  |  |  | |
| 1. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. |  |  |  | |
| 1. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. |  |  |  | |
| **Interpret functions that arise in applications in terms of the context** |  |  |  | |
| 1. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the* *function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity* |  |  |  | |
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| 1. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.  *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.* |  |  |  | |  |
| 1. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. |  |  |  | |
| **Analyze functions using different representations** |  |  |  | |
| 1. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. |  |  |  | |
| 1. Graph linear and quadratic functions. Show intercepts, maxima, & minima. |  |  |  | |
| 1. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. |  |  |  | |
| 1. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. |  |  |  | |
| 1. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. |  |  |  | |
| 1. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. |  |  |  | |
| 1. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. |  |  |  | |
| 1. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. |  |  |  | |
| 1. Use the properties of exponents to interpret expressions for exponential functions. |  |  |  | |
| 1. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of a quadratic function and an algebraic expression for another, say which has larger maximum.* |  |  |  | |
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| **CCSSM Curriculum Analysis Tool 1—Reasoning with Equations and Inequalities in Grades 9-12** | | | | | |
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| **Reasoning with Equations and Inequalities (A-REI)** |  |  |  |  | |
| **Understand solving equations as a process of reasoning and explain the reasoning.** |  |  |  |
| 1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. |  |  |  |
| 1. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. |  |  |  |
| **Solve equations and inequalities in one variable** |  |  |  |
| 1. Solve linear equations/inequalities in one variable, including coefficients represented by letters. |  |  |  |
| 1. Solve quadratic equations in one variable. |  |  |  |
| * 1. Use the method of completing the square to transform any quadratic equation in *x* into an equation of the form (*x* – *p*) 2 = q that has the same solutions. Derive the quadratic formula. |  |  |  |
| * 1. Solve quadratic equations by inspection, taking square roots, completing the square, the quadratic formula and factoring, as appropriate. Recognize when the quad. formula gives complex solutions. |  |  |  |
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| **Solve systems of equations** |  |  |  |  | |
| 1. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. |  |  |  |
| 1. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. |  |  |  |
| 1. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. |  |  |  |
| 1. (+) Represent a system of linear equations as a single matrix equation in a vector variable. |  |  |  |
| 1. (+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater). |  |  |  |
| **Represent and solve equations and inequalities graphically** |  |  |  |
| 1. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). |  |  |  |
| 1. Explain why the *x*-coordinates of the points where the graphs of the equations *y* = *f*(*x*) and *y* = *g*(*x*) intersect are the solutions of the equation *f*(*x*) = *g*(*x*); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations.  Include cases where *f*(*x*) and/or *g*(*x*) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. |  |  |  |
| 1. Graph the solutions to a linear inequality in two variables as a halfplane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes. |  |  |  |
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| **CCSSM Curriculum Analysis Tool 1— Geometric Measurement and Dimension; Modeling with Geometry in Grades 9-12** | | | | | |
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| **Geometric Measurement and Dimension (G-GMD)** |  |  |  | |  |
| **Explain volume formulas and use them to solve problems** |  |  |  | |
| 1. Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone.  *Use* *dissection arguments, Cavalieri’s principle, and informal limit arguments.* |  |  |  | |
| 1. Give an informal argument using Cavalieri’s principle for the formulas for the volume of a sphere and other solid figures. |  |  |  | |
| 1. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. |  |  |  | |
| **Visualize relationships between two-dimensional and three-dimensional objects** |  |  |  | |
| 1. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. |  |  |  | |
| **Modeling with Geometry G-MG** |  |  |  | |
| **Apply geometric concepts in modeling situations** |  |  |  | |
| 1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). |  |  |  | |
| 1. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). |  |  |  | |
| 1. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). |  |  |  | |
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| **CCSSM Curriculum Analysis Tool 1—Interpreting Categorical and Quantitative Data in Grades 9-12** | | | | | | |
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| **Interpreting Categorical and Quantitative Data (S-ID)** |  |  |  | | |  |
| **Summarize, represent, and interpret data on a single count or measurement variable** |  |  |  | | |
| 1. Represent data with plots on the real number line (dot plots, histograms, and box plots). |  |  |  | | |
| 1. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. |  |  |  | | |
| 1. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). |  |  |  | | |
| 1. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages.  Recognize that there are data sets for which such a procedure is not appropriate.  Use calculators, spreadsheets, and tables to estimate areas under the normal curve. |  |  |  | | |
| **CCSSM Curriculum Analysis Tool 1—Interpreting Categorical and Quantitative Data in Grades 9-12** | | | | | | |
| **Summarize, represent, and interpret data on two categorical and quantitative variables** | **Chapter pages** | **Cont N-L-M-**  **A-H** | | **Bal N-L-M-**  **A-H** | **Notes/Explanation** | |
| 1. Summarize categorical data for two categories in two-way frequency tables.  Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies).  Recognize possible associations and trends in the data. |  |  | |  |  | |
| 1. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. |  |  | |  |
| 1. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models. |  |  | |  |
| 1. Informally assess the fit of a function by plotting and analyzing residuals. |  |  | |  |
| 1. Fit a linear function for a scatter plot that suggests a linear association. |  |  | |  |
| **Interpret linear models** |  |  | |  |
| 1. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. |  |  | |  |
| 8. Compute (using technology) and interpret the correlation coefficient of a linear fit. |  |  | |  |
| 1. Distinguish between correlation and causation. |  |  | |  |
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| **CCSSM Curriculum Analysis Tool 1—Similarity, Right Triangles, and Trigonometry & Trigonometric Functions in Grades 9-12** | | | | |
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| **Similarity, Right Triangles, and Trigonometry (G-SRT)** |  |  |  |  |
| **Understand similarity in terms of similarity transformations** |  |  |  |
| 1. Verify experimentally the properties of dilations given by a center and a scale factor: |  |  |  |
| * 1. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. |  |  |  |
| * 1. The dilation of a line segment is longer or shorter in the ratio given by the scale factor. |  |  |  |
| 1. Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides. |  |  |  |
| 1. Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides. |  |  |  |
| 1. Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. |  |  |  |
| 1. Prove theorems about similar triangles. |  |  |  |
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| **Define trigonometric ratios and solve problems involving right triangles** |  |  |  |  |
| 1. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. |  |  |  |
| 1. Explain and use the relationship between the sine and cosine of complementary angles. |  |  |  |
| 1. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. ★ |  |  |  |
| **Apply trigonometry to general triangles** |  |  |  |
| 1. (+) Derive the formula *A* = 1/2 *ab* sin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side. |  |  |  |
| 1. (+) Prove the Laws of Sines and Cosines and use them to solve problems. |  |  |  |
| 1. (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces). |  |  |  |
| **Trigonometric Functions (F-TF)** |  |  |  |
| **Extend the domain of trigonometric functions using the unit circle** |  |  |  |
| 1. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. |  |  |  |
| 1. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle. |  |  |  |
| 1. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for π/3, π/4 and π/6, and use the unit circle to express the values of sine, cosine, and tangent for π–x, π+x, and 2π–x in terms of their values for x, where x is any real number. |  |  |  |
| 1. (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions. |  |  |  |
| **Model periodic phenomena with trigonometric functions** |  |  |  |
| 1. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. |  |  |  |
| 1. (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed. |  |  |  |
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| 1. (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context. ★ |  |  |  |  |
| **Prove and apply trigonometric identities** |  |  |  |
| 1. Prove the Pythagorean identity sin2(θ) + cos2(θ) = 1 and use it to find sin(θ), cos(θ), or tan(θ) given sin(θ), cos(θ), or tan(θ) and the quadrant of the angle. |  |  |  |
| 1. (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems. |  |  |  |
| **Overall Impressions:**   1. What are your overall impressions of the curriculum materials examined? 2. What are the strengths and weaknesses of the materials you examined?   **Standards Alignment:**   1. Have you identified gaps within this domain? What are they? If so, can these gaps be realistically addressed through supplementation? 2. Within grade levels, do the curriculum materials provide sufficient experiences to support student learning within this standard? 3. Within this domain, is the treatment of the content across grade levels consistent with the progression within the Standards? | | | | **Balance between Mathematical Understanding and Procedural Skills**   1. Do the curriculum materials support the development of students’ mathematical understanding? 2. Do the curriculum materials support the development of students’ proficiency with procedural skills? 3. Do the curriculum materials assist students in building connections between mathematical understanding and procedural skills? 4. To what extent do the curriculum materials provide a balanced focus on mathematical understanding and procedural skills? 5. Do student activities build on each other within and across grades in a logical way that supports mathematical understanding and procedural skills? |

Tool 2

Mathematical Practices

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| **CCSSM Mathematical Practices Analysis Tool 2** | **Page 1** |
| Name of Reviewer \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ School/District \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date \_\_\_\_\_\_\_\_  Name of Curriculum Materials \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Publication Date \_\_\_\_\_\_\_\_\_\_Grade Level(s) \_\_\_\_\_\_\_\_\_\_\_  Tool 1 Domain Considered \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | |
| **Opportunities to Engage in the Standards for Mathematical Practices  Found Across the Content Standards** | |

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| **Overarching Habits of Mind** | **1. Make sense of problems and persevere in solving them.** | **6. Attend to precision.** | |
| Evidence of how the Standards for Mathematics Practice were addressed  (with page numbers) |  |  | |
| **Reasoning and Explaining** | **2. Reason abstractly and quantitatively.** | **3. Construct viable arguments and critique the reasoning of others.** | |
| Evidence of how the Standards for Mathematics Practice were addressed  (with page numbers) |  |  | |
| **CCSSM Mathematical Practices Analysis Tool 2** | | | **Page 2** |
| **Modeling and Using Tools** | **4. Model with mathematics.** | **5. Use appropriate tools strategically.** | |
| Evidence of how the Standards for Mathematics Practice were addressed  (with page numbers) |  |  | |
| **Seeing Structure and Generalizing** | **7. Look for and make use of structure.** | **8. Look for and express regularity in repeated reasoning.** | |
| Evidence of how the Standards for Mathematics Practice were addressed  (with page numbers) |  |  | |

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| **Synthesis of Standards for Mathematical Practice** | | **Page 3** |
| **(Mathematical Practices 🡪 Content) To what extent do the materials demand that students engage in the Standards for Mathematical Practice as the primary vehicle for learning the Content Standards?** | | |
|
| **(Content 🡪 Mathematical Practices) To what extent do the materials provide opportunities for students to develop the Standards for Mathematical Practice as “habits of mind” (ways of thinking about mathematics that are rich, challenging, and useful) throughout the development of the Content Standards?** | | |
|
| **To what extent do accompanying assessments of student learning (such as homework, observation checklists, portfolio recommendations, extended tasks, tests, and quizzes) provide evidence regarding students’ proficiency with respect to the Standards for Mathematical Practice?** | | |
|
| **What is the quality of the instructional support for students’ development of the Standards for Mathematical Practice as habits of mind?** | | |
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|
| **Summative Assessment**  **(Low) – The Standards for Mathematical Practice are not addressed or are addressed superficially.**  **(Marginal) The Standards for Mathematical Practice are addressed, but not consistently in a way that is embedded in the development of the Content Standards.**  **(Acceptable) – Attention to the Standards for Mathematical Practice is embedded throughout the curriculum materials in ways that may help students to develop them as habits of mind.** | **Explanation for score** | |

**COMMON CORE STATE STANDARDS FOR MATHEMATICS**

**Standards for Mathematical Practice**

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council’s report *Adding It Up*: adaptive reasoning , strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately) and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one’s own efficacy).

**1 Make sense of problems and persevere in solving them.**

Mathematically proficient students:

* explain to themselves the meaning of a problem and looking for entry points to its solution.
* analyze givens, constraints, relationships, and goals.
* make conjectures about the form and meaning of the solution attempt.
* plan a solution pathway rather than simply jumping into a solution.
* consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution.
* monitor and evaluate their progress and change course if necessary.
* transform algebraic expressions or change the viewing window on their graphing calculator to get information.
* explain correspondences between equations, verbal descriptions, tables, and graphs.
* draw diagrams of important features and relationships, graph data, and search for regularity or trends.
* use concrete objects or pictures to help conceptualize and solve a problem.
* check their answers to problems using a different method.
* ask themselves, “Does this make sense?”
* understand the approaches of others to solving complex problems and identify correspondences between approaches.

**2. Reason abstractly and quantitatively.**

Mathematically proficient students:

* make sense of quantities and their relationships in problem situations.
* Bring two complementary abilities to bear on problems involving quantitative relationships:
* *decontextualize* (abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents and
* *contextualize* (pause as needed during the manipulation process in order to probe into the referents for the symbols involved).
* use quantitative reasoning that entails creating a coherent representation of the problem at hand, considering the units involved, and attending to the meaning of quantities, not just how to compute them
* know and flexibly use different properties of operations and objects.

1. **Construct viable arguments and critique the reasoning of others.**

Mathematically proficient students:

* understand and use stated assumptions, definitions, and previously established results in constructing arguments.
* make conjectures and build a logical progression of statements to explore the truth of their conjectures.
* analyze situations by breaking them into cases
* recognize and use counterexamples.
* justify their conclusions, communicate them to others, and respond to the arguments of others.
* reason inductively about data, making plausible arguments that take into account the context from which the data arose
* compare the effectiveness of plausible arguments
* distinguish correct logic or reasoning from that which is flawed and, if there is a flaw, explain what it is
* elementary students construct arguments using concrete referents such as objects, drawings, diagrams, and actions..
* later students learn to determine domains to which an argument applies.
* listen or read the arguments of others, decide whether they make sense, and ask useful question to clarify or improve arguments

**4 Model with mathematics.**

Mathematically proficient students:

* apply the mathematics they know to solve problems arising in everyday life, society, and the workplace.
* In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community.
* By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another.
* make assumptions and approximations to simplify a complicated situation, realizing that these may need revision later.
* identify important quantities in a practical situation
* map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas.
* analyze those relationships mathematically to draw conclusions.
* interpret their mathematical results in the context of the situation.
* reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

1. **Use appropriate tools strategically.**

Mathematically proficient students

* + consider available tools when solving a mathematical problem. (These tools might include pencil and paper, concrete models, a ruler, protractor, calculator, spreadsheet, computer algebra system, a statistical package, or dynamic geometry software.
  + are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations.
* High school students analyze graphs of functions and solutions generated using a graphing calculator
  + detect possible errors by using estimations and other mathematical knowledge.
  + know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data.
  + identify relevant mathematical resources and use them to pose or solve problems.
  + use technological tools to explore and deepen their understanding of concepts.

1. **Attend to precision.**

Mathematically proficient students:

* try to communicate precisely to others.
  + - try to use clear definitions in discussion with others and in their own reasoning.
    - state the meaning of the symbols they choose, including using the equal sign consistently and appropriately.
    - specify units of measure and label axes to clarify the correspondence with quantities in a problem.
    - calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context.
    - In the elementary grades, students give carefully formulated explanations to each other.
    - In high school, students have learned to examine claims and make explicit use of definitions.

1. **Look for and make use of structure.**

Mathematically proficient students:

* look closely to discern a pattern or structure.
  + Young students might notice that three and seven more is the same amount as seven and three more or they may sort a collection of shapes according to how many sides the shapes have.
  + Later, students will see 7 x 8 equals the well remembered 7 x 5 + 7 x 3, in preparation for the distributive property.
  + In the expression *x*2 + 9*x* + 14, older students can see the 14 as 2 x 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems.
* step back for an overview and can shift perspective.
* see complicated things, such as some algebraic expressions, as single objects or composed of several objects.

1. **Look for and express regularity in repeated reasoning.**

Mathematically proficient students:

* notice if calculations are repeated
* look both for general methods and for shortcuts.
* Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeated decimal.
* Middle school students might abstract the equation (y-2)/((x-1)=3 by paying attention to the calculation of slope as they repeatedly check whether the points are on the line through (1,2) with a slope 3.
* Noticing the regularity in the way terms cancel when expanding (x-1)(x+1)(x2+1) and (x-1)(x3+x2+x+1) might lead high school students to the general formula for the sum of a geometric series.
* maintain oversight of the process of solving a problem, while attending to the details.
* continually evaluate the reasonableness of intermediate results.

Tool 3

Overarching Considerations

Equity

Formative Assessment

Technology

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| **CCSSM Curriculum Materials Analysis Project--Overarching Considerations (Tool 3) Page 1**  **CCSSM Curriculum Analysis Tool 3 (Overarching Considerations)**  This tool should be used after reviewing mathematics curriculum materials using Tool 1 (Content Analysis) and Tool 2 (Mathematical Practices Analysis). After reviewing the curriculum materials carefully, answer the questions below reflecting important overarching considerations with regard to the materials. Overarching considerations are those that support the teaching of Mathematics Core Content and Practices. **Equity:** NCTM (1991) calls for teachers to build on how students’ linguistic, ethnic, racial, gender, and socioeconomic backgrounds influence their learning; to help students to become aware of the role of mathematics in society and culture; to expose students to the contributions of various cultures to the advancement of mathematics; and to show students how mathematics relates to other subjects; and to provide students with opportunities to apply mathematics to authentic contexts. CCSSM also notes that, “The Standards should be read as allowing for the widest possible range of students to participate fully from the outset, along with appropriate accommodations to ensure maximum participation of students with special education needs.” **Formative Assessment** is a critical part of classroom instruction, and curriculum materials can provide a variety of levels of support with regard to information to teachers about student learning. Finally, the increasing availability of **technology** offers opportunities to use technology mindfully in ways that enable students to explore and deepen their understanding of mathematical concepts. | | |
| Name of Reviewer \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_School/District \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Name of Curriculum Materials \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Publication Date \_\_\_\_\_\_\_\_\_\_Grade Level(s) \_\_\_\_\_\_\_\_\_\_\_ | | |
| **Rubric for answering questions about Overarching Considerations:**  **Not Found (N) - The curriculum materials do not support this element.**  **Low (L) - The curriculum materials contain limited support for this element, but the support is not embedded or consistently present within or across grades.**  **Medium (M) - The curriculum materials contain support for this element, but it is not always embedded or consistently present within or across grades.**  **High (H) - The curriculum materials contain embedded support for this element so that it is consistently present within and across grades.** | | |
| **Questions about Overarching Considerations (Page 1)** | **See Rubric** | **Comments/Examples** |
| **Equity** | **N-L-M-H** |  |
| **To what extent do the materials:** |  |  |
| 1. Provide teachers with strategies for meeting the needs of a range of learners? |  |  |
| 1. Provide instructional support to help teachers sequence or scaffold lessons so that students move from what they know to what they do not know? |  |  |
| 1. Provide opportunities for teachers to use a variety of grouping strategies? |  |  |
| 1. Embed tasks with multiple entry-points that can be solved using a variety of solution strategies or representations? |  |  |
| 1. Suggest accommodations and modifications for English language learners that will support their regular and active participation in learning mathematics? |  |  |

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| **CCSSM Instructional Materials Analysis Project--Overarching Considerations (Tool 3) Page 2** | | |
| **Questions about Overarching Considerations (Page 2)** | **See Rubric** | **Comments/Examples** |
| **To what extent do the materials:** | **N-L-M-H** |  |
| 1. Provide opportunities to use reading, writing, and speaking in mathematics lessons. |  |  |
| 1. Encourage teachers to draw upon home language and culture to facilitate learning? |  |  |
| 1. Encourage teachers to draw on multiple resources such as objects, drawings, and graphs to facilitate learning? |  |  |
| 1. Draw upon students’ personal experiences to facilitate learning? |  |  |
| 1. Provide opportunities for teacher and students to connect mathematics to other subject areas? |  |  |
| 1. Provide both individual and collective opportunities for students to learn using mathematical tasks with a range of challenge? |  |  |
| 1. Provide opportunities for advanced students to investigate mathematics content at greater depth? |  |  |
| 1. Provide a balanced portrayal of various demographic and personal characteristics? |  |  |
| **Assessment** |  |  |
| 1. Provide strategies for gathering information about students’ prior knowledge and background? |  |  |
| 1. Provide strategies for teachers to identify common student errors and misconceptions? |  |  |
| 1. Assess students at a variety of knowledge levels (e.g., memorization, understanding, reasoning, problem solving)? |  |  |
| 1. Encourage students to monitor their own progress? |  |  |
| 1. Provide opportunities for ongoing review and practice with feedback related to learning concepts, and skills. |  |  |
| 1. Provide support for a varied system of on-going formative and summative assessment (formal or informal observations, interviews, surveys, performance assessments, target problems)? |  |  |

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| **CCSSM Instructional Materials Analysis Project--Overarching Considerations (Tool 3) Page 3** | | |
| **Questions about Overarching Considerations (Page 2)** | **See Rubric** | **Comments/Examples** |
| **Technology** | **N-L-M-H** |  |
| **To what extent do the materials:** |  |  |
| 1. Integrate technology such as interactive tools, virtual manipulatives/objects, and dynamic mathematics software in ways that engage students in the Mathematical Practices? |  |  |
| 1. Include or reference technology that provides opportunities for teachers and/or students to communicate with each other (e.g. websites, discussion groups, webinars)? |  |  |
| 1. Include opportunities to assess student mathematical understandings and knowledge of procedural skills using technology? |  |  |
| 1. Include or reference technology that provides teachers additional tasks for students? |  |  |
| 1. Include teacher guidance for the mindful use of embedded technology to support and enhance student learning? |  |  |
| **Notes/Examples:** | | |
| **Summary Discussion Questions**   1. Equity: To what extent do the materials contain embedded support for elements of equity consistently within and across grades? 2. Assessment: To what extent do the materials contain embedded support for elements of assessment consistently within and across grades? 3. Technology: To what extent do the materials contain embedded support for elements of technology consistently within and across grades? 4. Overall: To what extent do the materials incorporate the Overarching Consideration elements to advance students’ learning of mathematical content and engagement in the mathematical practices? | | |